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ABSTRACT

Forty-four second grade students participated in a study examining the relationships between field dependence/independence (FDI), grammatical awareness, reading ability, and training in grammatical awareness. After the children were pretested for their levels of cognitive development, degree of field independence, grammatical awareness, and reading ability, they were ranked according to FDI level and randomly assigned to either a treatment group, which was given tasks that required manipulation of grammatical elements in some way, or a control group in which the children played games involving phonics and spelling. After 7 weeks of treatment, the students were measured again for grammatical awareness and reading ability. The results indicated that a child's reading performance is strongly affected by level of cognitive development, how field independent the child is, and the extent to which the child is able to use knowledge of grammatical structure while reading. Given the same level of cognitive development, children with more grammatical awareness were better readers than children with less grammatical awareness. Cognitive style was a factor in the acquisition of grammatical awareness, with field-independent children having higher levels of grammatical awareness than field-dependent children. There were no significant differences between the experimental and control groups on any of the pretest or posttest measures. (RL)

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GRAMMATICAL AWARENESS, FIELD INDEPENDENCE, AND READING ABILITY IN SECOND GRADE CHILDREN

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Grammatical Awareness, Field Independence, and Reading Ability in Second Grade Children

A perennial concern of reading researchers has been to isolate those factors which make learning to read much more difficult for some children than for others. Metalinguistic awareness is one factor that has recently been the focus of research. Broadly defined, metalinguistic awareness is the ability to deliberately make language the object of thought--to reflect on aspects of linguistic structure which are usually processed automatically. It appears to require a certain minimum level of cognitive development and begins to appear in children during their early school years (Gleitman et al, 1972). Metalinguistic awareness is a general term which may encompass a number of specific abilities. Among them, the development of word consciousness (the awareness that speech is made up of lexical units, and an understanding of how a word differs from a phoneme or a phrase) and the development of sound consciousness (the ability to detect sound segments in spoken words) have been extensively investigated because of their possible connection to reading ability. (See, e.g., Holden, 1972; Papandropalou and Sinclair, 1974; Downing, 1972; Holden and MacGinitie, 1973; Ehri, 1976, 1977) But grammatical awareness (the ability to reflect upon the syntactic structure of sentences) has received comparatively little attention from researchers. The conviction that grammatical awareness plays a crucial role in enabling children to develop fluency in reading led to the research described below. The goals of that research were threefold: to investigate the nature of the relationships between grammatical awareness and reading ability in young readers; to examine cognitive factors which might affect the development of grammatical awareness; and to explore the possibility that

children's grammatical awareness could be increased as a result of training, and that their reading performance would improve as a result. A summary of the theoretical rationale underlying these three areas of research appears below.

Grammatical Awareness and Reading

The investigation of the relationship between grammatical awareness and reading ability was based on the assumption that a sensitivity to grammatical constraints is important in the reading process. That assumption is justified by both theoretical and empirical factors. Theoretical support is found in those psycholinguistic and information-processing models and theories of reading which propose that either "top-down" (as in Goodman, 1970) or "interactive" (Rumelhart, 1976) processing is involved in the comprehension of written text. These theories reject both the notion that reading consists of the sequential letter-by-letter or word-by-word processing of print, and the assumption that all the information available to the reader comes from the text.

Empirical support comes from several sources: analyses of reading errors, which demonstrate the influence of syntactic and semantic factors (see, e.g. Weber, 1970; Goodman, 1965; Norman and Rumelhart, 1975; Kolers, 1973); studies of eye movements, which indicate that structural features of the text help to determine patterns of eye movements (see, e.g. Morton, 1965; Wanat, 1976; Gibson and Levin, 1975); and studies of the eye-voice span, which reveal that the length of the span is determined in part by the grammatical structure of what is being read (see, e.g. Buswell, 1920; Levin and Kaplan, 1968; Schlesinger, 1968; Levin and Turner, 1968; Rode, 1974).

Grammatical Awareness and Cognitive Development

Grammatical awareness, like other aspects of metalinguistic awareness, develops in children during their early school years, at the same time that reading skill is being established. Increasing cognitive capacity is undoubtedly a crucial factor in children's growing ability to reflect on their own thought processes, including those involved in language. Cognitively advanced children have consistently proven to be better at metalinguistic tasks than less advanced children. (See e.g. Gleitman et al, 1972; Scholl and Ryan, 1975; Forrest and Waller, 1979; Rounds, 1977) But the level of development alone is not enough to account for all differences in metalinguistic ability, since some differences can be found even among children at the same developmental level. It was in order to find an explanation for differences in the development and application of grammatical awareness among children of the same developmental level that the cognitive style dimension field dependence/independence was chosen as an independent variable in the research described herein. A Neo-Piagetian approach to cognitive development provided the theoretical rationale for predicting a relationship between cognitive style and metalinguistic performance. That rationale is based on Pascual-Leone's Theory of Constructive Operators (Pascual-Leone, 1969), which is briefly summarized below.

The Theory of Constructive Operators

In Pascual-Leone's model of the psychological system, the basic units are schemes: mental representations of all of a person's past and present experience, his knowledge of the world. Each scheme has two parts. The first -- the releasing component -- is a collection of cues or features that can be

matched to features in the field of perception. When features in that field can be matched to the releasing component of a scheme, that scheme is said to be activated, or ready to apply. The second part of a scheme -- the effecting component -- produces the meaning of the scheme when the scheme is applied. Although a number of schemes can be activated by a particular situation (because the releasing components of those schemes have some features in common) only the strongest schemes, and those that are compatible with other schemes, will actually apply and become involved in determining behavior.

The strength of a scheme is affected by five factors: first, the original weight of the scheme (the number of cues or features in the scheme which can be matched to features of the input); second, the extent to which, as a result of learning, the scheme has been incorporated into higher order structures (L-structures); third, two "field factors", one of which has to do with the perceptual salience of the scheme, and the other with the tendency to reduce input to its simplest form; forth, the amount of mental processing energy ("M-energy") available to boost the scheme; and fifth, an affective factor.

A person's M-level is defined as the maximum number of schemes that he is able to hold in mind and coordinate at any one point, and it increases with age from one at about age three to a maximum of seven in late adolescence. If a task requires the simultaneous coordination of three schemes, then a child with an M-level of two will be unable to succeed at the task. On the other hand, simply having the requisite M-level is not enough to ensure success on a given task. In addition, the relevant schemes that M must

boost must be a part of the repertoire. Cognitive development occurs as a result of the interaction of maturation --growth in M -- and experience -- growth in the repertoire of schemes.

The theory also provides an explanation for the differences in performance that can occur even among individuals with the same M-capacity. That explanation is based upon an analysis of cognitive style and how style can affect a person's tendency to use all of his available M-capacity in problem-solving situations. Field dependence/independence (FDI) was chosen as the relevant cognitive style dimension for this study because it seemed that both FDI tasks and tasks requiring metalinguistic awareness called for the use of M-energy to overcome misleading solutions boosted by field factors and previous learning.

Pascual-Leone (1974) has analyzed the FDI style dimension as representing the interaction of M-energy and field factors. In problem-solving situations, M-energy is mobilized by executive schemes. These are schemes which represent procedures to be followed to reach particular goals. Problem-solving situations may result in the activation of several kinds of executive schemes. Some executive schemes mobilize M-energy and direct its application in boosting schemes relevant to the goal at hand. Other schemes may emphasize attention to perceptual cues.

Cognitive style is the tendency for one type of executive scheme to apply instead of another in many different situations. Field independent (FI) people have a high functional M-power -- that is, they tend to use close to their full M-capacity -- because their M-power is easily mobilized and applied to the relevant schemes. FI people have the tendency to choose M-mobilizing executives when they are activated, rather than other executives

boosted by the perceptual cues in the situation. As a result of their tendency to use M, they have built up a rich repertoire of executive schemes and other L-structures relevant to cognitive tasks. Field dependent (FD) people, on the other hand, have a low functional M-power. Their tendency in problem-solving situations is to choose executive schemes derived from the perceptually salient aspects of the task. Their repertoire of executive schemes and other L-structures is sparse because of this tendency. Faced with FDI situations, which involve the overcoming of an embedding context by using a mental process that is not cued by the situation itself, FI people will be more successful because of their tendency to mobilize M-energy instead of relying on the more obvious schemes boosted by perceptual factors.

FDI and Metalinguistic Awareness

It seems probable that tasks requiring metalinguistic awareness have much in common with FDI tasks. They require the child to shift his attention from the level of meaning to lower levels of language structure which are normally processed automatically. Thus, metalinguistic tasks seem to share characteristics of other disembedding tasks, where mental energy is required to "pull out" the elements required for a solution and to ignore what is normally attended to. FI children can therefore be expected to be better at metalinguistic tasks than FD children. Their advantage is two-fold. First, as a result of past experience when they were more likely to have used M-energy than FD children, they may have built up more differentiated schemes reflecting syntactic patterns. These schemes would have more releasing components and hence be more likely to apply once activated.

Secondly, FI children may be more successful in performing metalinguistic tasks because they can build new task-relevant L-structures on the spot when M is mobilized, whereas FD children, who tend not to mobilize M, can only activate L-structures already in their repertoire.

The preceding arguments provided the basis for the assumptions underlying the research described here. Those assumptions can be summed up as follows. Grammatical awareness is important in the development of fluent reading. Children with more grammatical awareness are better readers than children with less awareness. The development of that awareness, and its application in reading, should be related to a child's level of FDI. The more field independent a child is, the more likely he will be to develop grammatical awareness. Finally, both level of grammatical awareness and level of FDI should be important predictors of reading ability. The specific hypotheses generated by these assumptions, and how they were tested in this study, will be presented in the Research Hypotheses and Results section.

METHOD

Subjects

The subjects were from the second grade in a K-6 school in suburban Napa county, California. The school's population is entirely white, and drawn from a relatively homogeneous middle to upper-middle class population. All of the children in the sample were native speakers of English. There were 45 second graders in the school, 44 of whom participated in the study. (One child's parents refused permission.)

Procedures

Pre-tests measured the children's level of cognitive development, de-

gree of field independence, grammatical awareness, and reading ability. Level of cognitive development (M-level) was measured by means of the Figural Intersection Test, a group measure developed by Pascual-Leone (1963). FDI was measured by the Children's Embedded Figures Test (Witkin et al,1971) and by the Water Level Test (Pascual Leone, 1966).

Grammatical awareness was measured by the Sentence Completion Test (SECO) developed by the author (Rounds, 1977, a & b) to measure children's ability to tap their knowledge of grammatical structure. The test consists of 30 items which were either incomplete phrases (found anything there) or incomplete units that crossed phrase boundaries (told to). They were constructed to tap children's knowledge of the following grammatical elements: indefinite quantifiers; passives; ditransitive complements; relative clauses; and non-finite clauses with and without subjects. Each item was typed on a 3 x 5 index card.

The test was administered individually to each child in an empty classroom, using the following procedure:

> Experimenter: I'm trying to find out what kinds of sentences children can make up. I'm going to show you some words and ask you to try to think of a sentence using those words. For example, if I showed you the words "a yellow truck", what kind of sentence could you think of?

At this point, every child could produce a sentence, usually of the type "The yellow truck is _____" or "I saw the yellow truck". If a child said "The truck is yellow" he was asked to think of a sentence that kept "yellow" and "truck" together. Each child was then shown the 30 index cards, one at a time, and the sentences he produced were written down by the experimenter. If a child had trouble reading a word, the correct word was supplied. The entire session was tape-recorded.

Unlike most other measures of grammatical awareness, the SECO does not require children to make judgments about grammaticality. Instead it forces children to use their metalinguistic awareness to recognize the grammatical features which constrain particular constructions. Because the items have no intrinsic communicative purpose, the child must reconstruct a meaningful utterance, and in doing so must pay attention to the form of what was said. The rigorous constraints on the possible sentences that can be constructed force the child to pay attention to subtle grammatical features in order to be successful. Thus, the ability to successfully incorporate a large proportion of the SECO items in grammatical sentences is evidence of a high level of grammatical awareness.

Reading ability was assessed in two ways: by measuring the eye-voice span and by evaluating performance on a series of cloze tests. These measures were chosen because it was felt that performance on these tasks would reflect children's ability to use their knowledge of grammatical structure better than would standardized tests of reading ability. Both measures were constructed using the vocabulary from the Harper Row third pre-primer, which was the last book completed by the children in the lowest reading group in December, when the testing began. This was done to ensure that all the children would have been exposed to the vocabulary used in the tests.

The eye-voice span (EVS) was measured according to the procedure described by Levin and Turner (1968) and Rode (1974). A wooden box was constructed with a one-way mirror in its slanted front surface. Subjects could see through the mirror to read the target sentences only when the light inside the box was on. The light was activated by a micro-switch on the right-hand side of the box. The experimenter sat next to this side of the

box and turned the light on and off. The material to be read was typed on pale blue 5 x 8 index cards. The contrast between letters and background was low enough to eliminate any after image. The following directions were given:

> Experimenter: When the light goes on I'd like you to begin reading the story just as you would read a story aloud for your teacher. While you're reading, I'm going to turn off the light so you won't be able to see the words anymore. When the light goes off, I'll ask you to tell me as many words as you can remember that you think you saw before the light went off.

Children read a series of 40 test items. Thirty of these were three-sentence paragraphs in which the target sentence was either the second or third sentence. Ten of the items were lists of words taken from the sentences and presented in random order. Both sentences and word lists were typed double space and were three lines long. The target sentences were constructed and typed so that at least ten words remained in the sentence and on the line after the light-out position. In addition, the target sentences were constructed so that the grammatical elements that occurred at the light-out position were the same as those contained on the SECO.

Because one focus of the study was on children's ability to use grammatical cues in reading, the cloze tests were not constructed using the usual random deletion procedure. Instead, the deletions were made in particular grammatical constructions--the same constructions used in the EVS and SECO tests.Four stories were written using the Harper Row pre-primer vocabulary and incorporating the desired grammatical constructions. Deletions were then made in those constructions. Another departure from traditional cloze-test procedure was made because of the children's age. The tests were administered individually by the experimenter. The child read the story aloud, and the experimenter wrote in the missing words on

the paper as the child supplied them.

After the pre-testing, children were ranked according to FDI level and randomly assigned to either a treatment or control group. Children in both groups participated with the experimenter in ten individual 15-minute sessions over a seven-week period. Children in the control group played games involving phonics and spelling, while children in the treatment group were given tasks that required them to manipulate grammatical elements in some way. Grammatical awareness and reading ability were measured again in post-tests administered after the training was completed.

RESEARCH HYPOTHESES AND RESULTS

Research hypotheses fell into four categories: the relationship between FDI and grammatical awareness; the relationship between FDI and reading ability; the relationship between grammatical awareness and reading ability, and the effect of the training on grammatical awareness and reading ability.

FDI, Grammatical Awareness, and Reading Ability

Because metalinguistic tasks in general, and the SECO in particular, share characteristics with other disembedding tasks which are used to differentiate between FI and FD people, it was expected that FI children would have higher SECO scores than FD children. Because FI children are more likely to have built up the kinds of complex cognitive structures that are necessary for fluent reading, it was also expected that FI children would have higher cloze test scores and longer eye-voice spans than FD children.

All three hypotheses were tested by means of Pearson product-moment correlations, and all were accepted. But because level of cognitive develop-

ment could be expected to affect level of grammatical awareness and reading ability--the developmentally advanced children would tend to do better--partial correlations were also computed to reveal the role of FDI alone in determining SECO, cloze, and EVS scores. When level of cognitive development (M) was controlled for, significant correlations between FDI and the six measures remained, although they were somewhat lower than the original correlations, as can be seen in Table 1.

Table 1

Correlation Coefficients for FDI and Measures of Grammatical Awareness and Reading Ability

	SECO 1		SECO 2		Cloze 1		Cloze 2		EVS 1		EVS 2	
	r	r^2	r	r^2	r	r^2	r	r^2	r	r^2	r	r^2
With FDI	.43*	.18	.51*	.26	.64*	.41	.57*	.32	.59*	.35	.58*	.34
With M Contr.	.30*	.09	.38*	.14	.55*	.30	.47*	.22	.54*	.29	.57*	.22

Grammatical Awareness and Reading Ability

The processing of increasingly larger units of text which is required for fluent reading is possible only when the reader has access to and uses his knowledge of grammatical structure. For this reason it was predicted that children with high SECO scores would have longer eye-voice spans and higher cloze test scores than children with low SECO scores. To test these hypotheses, the following correlation coefficients were computed: SECO 1 with EVS 1 and cloze 1; SECO 2 with EVS 2 and cloze 2. In addition,

* Significant at .05 level

partial correlations were done with M-level controlled.The results appear in Tables 2 and 3.

Table 2

Correlation Coefficients for SECO 1
With Cloze 1 and EVS 1

	EVS 1		Cloze 1	
	r	r^2	r	r^2
SECO 1	.74*	.55	.72*	.52
With M Controlled	.69*	.48	.66*	.44

Table 3

Correlation Coefficients for SECO 2
With Cloze 2 and EVS 2

	EVS 2		Cloze 2	
	r	r^2	r	r^2
EVS 1	.73*	.53	.79*	.62
With M Controlled	.68*	.46	.75*	.56

There was a very strong relationship between performance on SECO and performance on the two reading measures, with variance in SECO scores accounting for from 52 to 62% of the variance in the reading measures. Even when developmental differences were taken into account, the relationship remained strong.

Correlations between the two reading measures were also high, as can be seen in Table 4.

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* Significant at .05 level

Table 4

Correlation Coefficients For EVS 1 and 2
With Cloze 1 and 2

	Cloze 1			Cloze 2	
	r	r^2		r	r^2
EVS 1	.76*	.58	EVS 2	.73*	.53
With M Contr.	.73*	.53	With M Contr.	.68*	.46

The strong positive relationship between performance on the two reading measures and on SECO--and between performance on the EVS and on the cloze test--provides support for the notion that the ability to recognize and manipulate grammatical structure is an important component of skilled reading. The assumption that such a relationship existed provided the rationale for the training portion of the study. If grammatical awareness could be improved through training, reading performance might improve as a result.

Effect of training on grammatical awareness and reading ability

It was hypothesized that training which focused on the manipulation of certain grammatical elements within sentences would increase the likelihood that cognitive structures or schemes representing those elements would be used in subsequent tasks. This led to the prediction that children in the treatment group would show a greater increase in post-test SECO, cloze, and eye-voice span scores than control group children.

* Significant at .05 level

Each hypothesis was tested by means of an analysis of variance. An ANOVA was done for each pre-test (SECO 1, cloze 1, EVS 1) to determine that there was no significant difference between the two groups before the treatment began. A second set of ANOVA's was done for each post-test (SECO 2, cloze 2, EVS 2). In each case, treatment condition was the independent variable and pre- or post-test score the dependent variable. There were no significant differences between the experimental and control groups on any of the pre- or post-test measures. None of the three hypotheses was supported.

Interaction of Style and Training

It was predicted that within the experimental group, FI children would show a greater effect of training than would FD children because they would be more likely to acquire and use the new cognitive structures the training aimed to develop. Three hypotheses were derived from this prediction, one for each of the three measures. Each hypothesis was tested by means of a regression analysis in which the post-test score of the test in question was the dependent variable, and the pre-test score and level of FDI were the independent variables entered in the multiple regression equation.

The results of these analyses showed that there were no significant differences between FI and FD children's performance on either the cloze or the EVS tests. But there was a significant difference in their performance on the SECO. The hypothesis that FI children would show a greater increase in post-test SECO scores than FD children was supported, as shown in Table 5. When pre-test SECO scores were partialled out, there was a significant association between FDI and post-test

SECO scores. Variance in FDI scores contributed an additional 11% to variance in post-test SECO scores.

Table 5

Regression Summary for SECO 2: SECO 1 and FDI

Dependent Variable: SECO 2

	Variable Entered	F to Enter	Sig.	Mult. R	R^2	R^2 Change
Step 1	SECO 1	22.613	.00	.728	.531	.531
Step 2	FDI	5.751	.027	.780	.640	.110

An important factor in any training study is the duration and intensity of the training. To be effective, training in any future study must be more intense than what was possible in the study described herein. But even if more intense exposure is provided, it may still be insufficient to raise the level of grammatical awareness of field dependent children. Field independent children appeared to do well with the essentially inductive approach of the training in the present study, where the activities were presented without any explicit instruction. They were able to abstract the relevant generalizations on their own. But field dependent children may need both a longer exposure and more explicit instruction which can help them focus on and retain the relevant generalizations.

Another point to be considered is that, in the present study, the field independent children--who tended to profit from the training--were already making good progress in reading. Training in grammatical awareness may be more important for those children who are not making good progress. Since many of these children may be field dependent, the hypothesis that field

Table 6

Regression Summary for EVS 1: Level of Cognitive Development, FDI, and SECO 1

Dependent Variable: EVS 1

	Variable	F	Sig.	Mult. R	R^2	R^2 Change
Step 1	M	3.69	.062	.2842	.0808	.0808
Step 2	FDI	17.06	.000	.5924	.3509	.2701
Step 3	SECO 1	35.31	.000	.8095	.6553	.3043

Table 7

Regression Summary for Cloze 1: Level of Cognitive Development, FDI, AND SECO 1

Dependent Variable: Cloze 1

	Variable	F	Sig.	Mult. R	R^2	R^2 Change
Step 1	M	9.8278	.003	.4355	.1896	.1896
Step 2	FDI	17.5022	.000	.6573	.4321	.2424
Step 3	SECO 1	24.9381	.000	.8063	.6502	.2181

These results indicate that a child's reading performance is strongly affected by his level of cognitive development, how field independent he is, and the extent to which he is able to use his knowledge of grammatical structure as he reads. While previous research has shown that grammatical awareness generally increases as children get older, and that children with more grammatical awareness are better readers, this study demonstrated that given the same level of cognitive development, children with more grammatical awareness were better readers than children with less grammatical awareness. It also suggests that cognitive style is a factor in the acquisition of grammatical awareness. Again, given the same level of development, FI children had higher levels of grammatical awareness than did FD children.

DISCUSSION

The Role of Grammatical Awareness in Reading

The analysis of children's responses to the eye-voice span test revealed that even poor readers are able to take advantage of their knowledge of grammatical patterns as they read to some extent. One of the striking things about the EVS data was the very low proportions of responses which were not appropriate syntactically or semantically. What differentiated the good from the poor readers was not that good readers used their knowledge of linguistic structure and poor readers did not, but that good readers were able to make more extensive use of it, and to report longer and/or more complex structures. For example, in response to the following EVS item (When he got back he*was glad to be home with Mark and Janet and Mother)[1] one of the poorest readers responded with was cold. The graphic influence is obvious. But it is also true that her response is syntactically appropriate and not unreasonable semantically. She did not report was glass, for example. She correctly interpreted the sentence as being of the Subject-Verb-Complement type. But for her, the complement was the single word cold. Many good readers, on the other hand, were able to report as many as five words past the light-out position. In order to do this, they must perceive that the subject is more elaborate than the single word glad.

To take another example, consider the item (I can*make it go faster than your little red car). One very poor reader responded with make a car. This response is semantically reasonable and syntactically appropriate.

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[1] The asterisk indicates the point at which the light was turned off. The target structure is underlined.

A sentence beginning "I can make" could be of the Subject-Verb-Direct Object form, in which case car could be an appropriate object of the verb make. But better readers saw the more complex structure in which the direct object of make was not a single word, but a non-finite clause, enabling them to report the relevant structure make it go.

The limited kinds of responses that poor readers made can be compared to the partially correct responses they tended to make on the cloze tests. These responses made sense within a particular portion of the sentence, but not when the entire sentence was considered. (e.g. Mark liked ___pie___ eat apple pie.) Even when poor readers had the entire sentence to look at, as they did in the cloze test, they were often unable to coordinate the post-blank information with what had come before the blank. On both the EVS and the cloze test, poor readers demonstrated a limited ability to coordinate complex structures as they were reading. They could make use of some, but not all, of the syntactic and semantic cues present in the text.

One factor contributing to good readers' superiority is their ability to coordinate larger and more complex grammatical units as they read. There may be two factors affecting this ability. One is an increased efficiency in the mechanics of reading, and the second is a greater mental processing capacity compared to poorer readers. The greater efficiency may be explained as follows. Good readers are more efficient -- can read faster and more accurately -- because they have a richer repertoire of schemes representing grammatical structures than do poor readers. The repertoire is richer in two ways: they have more schemes, and the schemes they have are more complex. These schemes are likely to be L-structures in which a number of cues -- such as notions as

to privileges of occurrence, as well as syntactic and semantic features--have become associated with particular kinds of grammatical structures. When such an L-structure is activated, it adds releasing components to simple word-recognition schemes activated by individual words appearing in the text. Consider the EVS item cited earlier: I can make it go faster than your little red car. As the good reader comes to the word than, the releasing components for a word-recognition scheme could include both the graphic cues in the word than, and syntactic cues contained in a "comparative" scheme activated by faster (X-Verb-Comp. adjective-than-Y). If syntactic cues have been added to graphic cues, less attention may need to be paid--less time spent-- on looking at than, and the eye can already be moving ahead to fill in the missing slot of the comparative scheme.

When grammatical structure schemes are not activated, or when they are less differentiated (have fewer cues), word-recognition schemes assume more importance. Thus a poor reader may be forced to rely more heavily on visual information. He is less efficient than the good reader because he is less able to take advantage of the larger structural units in the text. He is less able to do this because he has less grammatical awareness, which is just another way of saying that his repertoire of grammatical schemes is sparse. That good readers have more grammatical awareness than poor readers is demonstrated by the high positive correlations of SECO with scores on EVS and cloze tests.

The second factor that differentiates good readers from poor readers is cognitive rather than linguistic. Good readers have a larger processing capacity. The difference in processing capacity may be either

structural or functional. A structural difference refers to absolute capacity. One child may have an M-level of two while another child has an M-level of three. A functional difference reflects stylistic differences. Two children may have the same structural M-level, but the FI child will tend to operate at his structural M-level most of the time. Both structural and functional differences in processing capacity were related to reading ability in the present study. Both M-level and level of FDI were important predictors of scores on both the cloze and EVS measures. Whatever the cause of the difference--whether developmental or stylistic--the child with more processing capacity has an obvious advantage.

In the first place, the greater M-capacity makes it more likely that new L-strucures representing the grammatical patterns will be formed, and that existing L-structures can be coordinated into even more complex structures, which are then more likely to be activated in a greater variety of situations. An examination of responses to one of the passive items (The black sheep*was sold to a man...) may illuminate this point as we consider how a passive scheme might gradually become elaborated.

A child with no passive scheme might see the above sentence as an example of the Subject-Verb-Complement type, leading to the reading "The black sheep was old"-- a common response--or even "The black sheep was bold". Since sentences of that type are more common than passives in ordinary speaking and listening, and in stories children are reading, it is not surprising that a Subject-Verb-Complement scheme would develop before a passive scheme. Gradually, a child may come to associate two kinds of structures with--have two kinds of schemes that can be activated

by--sentences whose first two constituents are a subject and some form of the verb to be: one representing a subject complement sentence, and the other a passive sentence. Children who had developed this second kind of scheme were able to report "The black sheep was sold". The passive scheme may eventually become more elaborated to include the kinds of prepositional phrases that are likely to occur with passives along with the semantic features that limit their use. Children with these more elaborated passive schemes were able to report "The black sheep was sold to a man" .

Greater M-capacity also means that a child has more space to reflect on meaning, to coordinate previous information within sentences and from one sentence to another. While all children strive to make sense out of what they read, good readers are more successful. On both the cloze test and the EVS, they were less likely to make responses that did not fit the context. A striking example of that concern with meaningfulness was demonstrated by one good reader on the EVS test. The item in question read as follows:

> One morning Mother had to go to town. But
> the car was not working so she had to take the
> bus. When she got on the bus, she asked,
> "Will this*bus take me to the new store on Brown Street?"

As he read the last sentence, he misread on the bus as off the bus. When the light went out, he first reported "bus take me to town" but then paused and corrected himself: "No, home--it has to be home." (Experimenter: "Why?") "Because she already went to town--that bus stopped--and now they're already at town right now!" This ability to reflect on the meaning of what one is reading was further exemplified in the comment made by another good reader. After he had correctly reported a long string of words after the light went out, the experimenter asked,"Did you see all of that, or were you guessing the last part?" He replied, "No--I just--you know it's a

a sentence, and when you stop--turn off the light--you just know what the rest of it is 'cause you know what kind of a sentence it is--and you know what will go with it and what won't, kind of like that."

IMPLICATIONS

The results of this study indicate that both cognitive and linguistic factors have a strong influence on the reading performance of second grade children. The results also suggest that it may be possible to manipulate the linguistic factor--grammatical awareness--and thereby increase reading ability, but only if the cognitive factors are taken into account.

Further research is needed to develop training techniques to increase the level of grammatical awareness in field dependent children. Once it has been demonstrated that metalinguistic training can succeed with both FD and FI children, the relationship between improved grammatical awareness and reading scores can be re-examined. It must be emphasized, however, that any future study must be of sufficient duration for results to become apparent. It might be possible, for example, for significant improvements in SECO scores to be made after a five or six week intensive training period. But it might be necessary to continue the metalinguistic activities for an additional period of time before the increased awareness would transfer to reading. It would also be useful to document by further research the relationships among levels of cognitive development, field independence, and grammatical awareness in other grades than second.

The SECO as a Research Tool

The SECO is of interest to researchers concerned with the development of metalinguistic ability in school-age children. In previous research (Rounds,

1977 a & b), SECO was used with first, second and third graders, and in the present study with second graders. As presently constituted, it is probably too difficult for the average first grader. The first graders in the earlier research were above average in reading ability and general school performance. If it were to be used on a large scale with first graders, the more difficult structures should be eliminated and some simpler items introduced. Complete phrases are not too easy for the average first grader and will keep the task from being too frustrating.

If the difficulty of the structures used were increased, it is probable that the task could also be used with children beyond the third grade. The items used must be difficult enough to "push the metalinguistic button"--to force the child to consider structural aspects of the language, but not so difficult that he will be unaware of any of the relevant grammatical cues. If items are too easy, children can readily incorporate them in sentences without consciously tapping metalinguistic skills.

The kinds of structures that are used in the SECO can be varied according to the research questions of interest. Only a few kinds of grammatical structures have been explored--many more remain to be investigated. Once the relative difficulty of a variety of structures has been established, longitudinal research can be done. As children are re-tested at periodic intervals, more difficult structures can be added to the test, and the pattern of the development of grammatical awareness in particular children can be closely studied.

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